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METHOD FOR THE PLACEMENT OF ORTHODONTIC BRACKETS

Field of the invention

- 10 [0001] The present invention is related to a novel method for placing and positioning orthodontic brackets. The invention is further related to a clear transfer tray and a tool for use in said method

15 State of the art

- [0002] Correctly positioning orthodontic brackets has always been an important factor in a qualitative and efficient orthodontic treatment, and its importance has only grown with the introduction of the Straight Wire<sup>TM</sup> technique. In the past, best result were achieved by the best wire bending, but in the future the best results will be achieved by the best bracket positioning.

- [0003] Until now, mostly direct techniques have been applied when placing orthodontic brackets. Using this technique, brackets are placed directly on the teeth. Correct positioning is based on the middle point of the long axis of the tooth crown, or on measuring instruments such as gauges, which allow to measure from the incisal or occlusal plane of the tooth. This system is prone to errors in the vertical, horizontal and axial directions.

- [0004] Indirect bonding systems exist also, and include an extra step when positioning brackets on teeth. First, a model of the teeth is made in plaster or plastic.

The brackets are placed on the model mostly based on reference lines, followed by the fabrication of a transfer tray or by a so-called "clear transfer tray", a plastic plate construed to the model using a vacuum (e.g. by using  
5 the Biostar apparatus).

[0005] The indirect technique has several advantages over the direct technique. A more accurate positioning of the brackets is possible because it is possible to verify the teeth from all perspectives. It is therefore possible  
10 to take special circumstances such as incisal or cuspid wear, the necessity for extra rotation, tip or torque. The orthodontist can use all his experience for correctly positioning the brackets, and does not have to consider discomfort for the patient, keeping the operation area dry,  
15 view-impediment by cheeks and lips, and movement of the brackets during the gelphase, thereby reducing the adhesive power of the brackets considerably. The brackets can be placed quicker, reducing the time for the orthodontist and the discomfort for the patient, with a better end result  
20 and client satisfaction.

[0006] There are however several disadvantages associated with the indirect techniques from the prior art. The transfer of the brackets from the model to the patient is cumbersome and a bad placement of the transfer tray  
25 leads to a bad positioning of all the brackets. Sometimes, brackets are lost on transfer, or released from the correct position when removing the tray. The technique is also very work-intensive: the placement on the model, hardening of the glue, fabrication of transfer tray, release of the  
30 brackets from the model and cleaning of the bracket basis take considerable lab time, which leads to higher costs. Further, the technique requires very high precision, and a small error can be magnified to serious defects.

**Aims of the invention**

[0007] The present invention aims to provide a new indirect bracket placement technique which solves the problems associated with the indirect placement methods of the state of the art. In particular, a reduction of preparation costs and lab time is a primary aim of the present invention. In other words, it is an aim of the present invention to develop a more direct indirect bracket placement technique.

**Summary of the invention**

[0008] The present invention is related to an indirect bracket placement method for correctly positioning brackets on a patient's teeth, comprising the steps of:

- Providing a model of the patients teeth,
- Providing a reference marking on said model indicating correct positioning of brackets,
- Manufacturing a transfer tray of the model, wherein said reference marking is visible on said transfer tray, and
- Providing holes at the exact bracket positions in said clear transfer tray, said holes allowing placement of brackets in the exact position.

[0009] The indirect bracket placement method of the present invention can be further characterised in that the holes provided in the clear transfer tray are of the dimensions of the bracket base. The gingival parts of the transfer tray can be removed to enable removal of the tray after placement.

[0010] Another aspect of the present invention concerns a tool for providing holes in a clear transfer tray, said tool comprising on a first side a reference for correct placement of said tool, and on a second side a

cutting plate dimensioned as a bracket base, said first and second side co-operating to cut away from the clear transfer tray the form of the bracket base at the exact position.

5 [0011] The tool of the present invention can further comprise on the second side a reference for correct placement of said tool. Preferably, the reference is a cross. Advantageously, the tool is executed as a pair of nippers.

10 [0012] Another aspect of the present invention concerns a transfer tray for use in the indirect bracket placement method of the present invention, wherein said transfer tray is based on a model of a patient's teeth, characterised in that said transfer tray comprises  
15 perforations at the exact bracket positions, said perforations allowing placement of brackets in the exact position. In the transfer tray of the invention, the perforations preferably have the form of the bracket base. Advantageously, the gingival part above the perforations is  
20 removed to allow easy removal of the transfer tray after bracket placement.

#### Short description of the drawings

[0013] Fig. 1 represents the drawing of reference  
25 lines to the model.

[0014] Fig. 2 represents a clear transfer tray over the model.

[0015] Fig. 3 shows a clear transfer tray with stars cut out at exact positions.

30 [0016] Fig. 4 and 5 shows nippers particularly suited for practising the invention.

#### Detailed description of the invention

[0017] In the present invention, a novel indirect placement method is disclosed.

[0018] The first step is the manufacture of a model of the patient's teeth, using any of the known impression techniques using alginate or silicone. On this model, reference lines are added with a pencil using the orthodontist's preferred technique. All techniques are possible, such as midpoint of the long axis of the crown, marginal height of premolars (Dr. Kalange), determination of vertical height using gauges,...

[0019] In an optional second step, the reference lines can be marked with crosses using e.g. plastic adhesive.

[0020] The next step comprises the manufacture of a transfer tray, using e.g. a vacuum apparatus such as the Biostar apparatus from Scheu. All other vacuum or pressure systems known can also be used. Several suitable polymer plates are suitable for this and are commercially available. Plate Duran 1.0 mm, Duran 1.5 mm, Copyplast 1.5 mm and Bioplast 1.0 mm give good results. Equivalent or comparing plates from other companies can also be used.

[0021] Clear impression materials that harden on a plaster model can be used, they should be hard enough to be form stable and cut-able, but flexible enough to provide a good fit (going over the undercuts) on the teeth of the patient.

[0022] The pencil markings are transferred to the transfer tray and are clearly visible from the outside. In case plastic adhesive crosses have been used, small recesses are created in the overlay. The overlay now has all the information needed for placing the brackets.

[0023] In contradiction to the prior art techniques, the brackets are now not mounted on the model. Instead, holes are made of the exact dimensions of the bracket base

in the defined location on the overlay. The references on the overlay are used to determine the exact position of the brackets.

[0024] From the overlay tray, the gingival parts are cut away to enable removal of the tray after placement of the brackets. The removal of the gingival part is optional and not necessary in case the transfer material is flexible enough, or when the brackets do not have hooks. Evacuation spaces for excess bonding material can be provided. After verification of the tray dimensions in the patient's mouth, the tray is fitted and fixed e.g. by letting the patient bite on cotton rolls.

[0025] The next step comprises the etching of the teeth through the holes, followed by rinsing and drying. Self-etching primer manufactured by 3M, Espe or others can also be used. The brackets can now be placed exactly in the holes and fixed with the help of a polymerisation light as known in the art. Finally, the tray can be removed from the mouth in occlusal direction.

[0026] Different techniques are available for providing the holes in the overlay tray. Reference is made to figures 4 and 5. Specially designed nippers 1, have a reference cross (2) marked on one or preferably both sides. This side is the side that is placed on the inside of the tray, ensuring that the nipper's reference lines correspond exactly with the reference lines on the overlay tray. A more correct placement is realisable when both sides have a reference cross. In case plastic adhesive crosses are used to mark the position, the nippers can be provided with a similar cross form, which fits the recesses in the transfer tray formed by the plastic markers. The other side of the nippers comprises plates (3) with an opening corresponding to the bracket base, allowing intrusion of the first side (2) of the nippers 1. When applying pressure on the nippers

when correctly positioned, they will form a hole with the required dimensions and position. Evacuation space for excess bonding material can be provided. Further, the overlay plate parts underlying the holes as cut are removed  
5 to enable removal of the tray after bracket placement.

[0027] Another method for providing the holes in the overlay tray can be high-pressure water cutting or laser cutting. A programmable apparatus can be provided. All bracket base forms can easily be stored in memory and the  
10 reference markings can be detected by the apparatus to cut the hole on the precise location indicated by the reference lines.

[0028] Further, digital model and digital set-up can be used for more precise bracket positioning measurements.  
15 Digital modelling is already used (Geodigm, Invisaline) and makes it possible to provide 3D digital models and make a virtual bracket set-up. The digital model can be marked as explained before, and used as a base for providing the overlay tray.